Eighty presents were announced as having been received since the last meeting, including, amongst others :—

A $3\frac{1}{4}$-inch Equatorial Telescope, by Ross, with tripod stand, micrometer, &c., presented by Mrs. Mann ; W. F. Denning, The Great Meteoric Shower of November ; C. E. Peek, Variable Star Notes, No. 2 ; G. Johnstone Stoney, On Atmospheres upon Planets and Satellites, presented by the Authors ; Bonn Observatory, Eigenbewegungen von 335 Sternen, von F. Küstner ; Lick Observatory, Photographic Atlas of the Moon, plates 6–19, presented by the Observatories ; Photographs of nebulæ made with 24-inch reflector (lantern slides), presented by Mr. W. E. Wilson.

A determination of the Latitude-Variation and of the Constant of Aberration, from observations made at the Royal Observatory, Cape of Good Hope, 1892–94. By W. H. Finlay, M.A.

In the early part of 1892 a series of observations with the zenith telescope was commenced by Dr. Gill, for the purpose of determining the latitude-variation at the Cape, and the constant of aberration ; but pressure of other work led him to transfer the investigation to me at the end of the year.

Observations were continued throughout 1893 and 1894, but no use has been made of those taken after 1894 April. At this date the ether in the level suddenly evaporated to such an extent as to render work impossible. An attempt was made to refill the tube on the spot and observations were continued, but the result was not satisfactory : the bubble became very sluggish and sticky in places, so that the observations after this operation are affected with large accidental errors, and are not nearly comparable in accuracy with the earlier ones. Indeed, it may be said that the level was a weak point all through.

The value of one revolution of the micrometer-screw was determined from a number of transits of close polar stars at elongation, and the screw errors were carefully investigated.

Three groups of stars, each consisting of three pairs, were selected at R.A. 7^h, 15^h, 23^h respectively, and another three at R.A. 3^h, 10^h, 19^h. The programme laid down was that eight observations of one of these groups should be made soon after sunset, and eight of another before sunrise, as nearly as possible on the same dates. Care was also taken to secure as many sets starting "lamp east" as starting "lamp west." The total number of pairs observed was 621.

The reductions to apparent place were interpolated for the time of transit, and the small terms depending on the Moon's longitude were taken into account. The proper motions were

adopted from a discussion of all the available declinations of the stars, and in some cases they proved to be considerable—*e.g.* Lac. 2437, $-''{\cdot}334$: Lac. 2608, $+''{\cdot}370$: L[1] Puppis, $-''{\cdot}118$: Lac. 8109, $-''{\cdot}16$.

From every observation of a pair a correction to the adopted latitude was obtained, and the means of about four nights were taken for investigation. These were all considered to have equal weight, as no observations of a group were included unless at least two pairs were observed.

For a general solution the equations of condition were put in the form

$$\mathrm{C} + x \cos \mathrm{M} + y \sin \mathrm{M} + x' \cos \mathrm{N} + y' \sin \mathrm{N} - \mathrm{A}\rho = n,$$

where C is a constant for each group and depends on the assumed declinations of the stars and the adopted mean latitude : x, y, x', y' are coefficients of the periodic variation of latitude.

M and N are angles which go through their periods uniformly in 427 days and 365 days respectively, and are reckoned from 1893·0.

A is the mean of the aberration terms in the stars' reductions to apparent place, divided by 20·445.

ρ is the correction to the constant of aberration ($20''{\cdot}445$).

n is the mean of the observed corrections to the assumed latitude.

It was not anticipated that there would be any sensible personal equation between the two observers, and no particular care was taken to secure a comparison between them. Both observers took part in the observations of groups 4 and 5 at the end of 1892 and beginning of 1893. A comparison of these few results would seem to indicate that a correction of $-0''{\cdot}15$ has to be applied to observations by G to reduce to the standard of F, but the observations are too few to settle this point. A term G has therefore been introduced into the equations of condition for 1892, in order to represent the relative personal equation.

From all the equations of a group normals were formed in C, x, y, &c., and the value of C derived from its normal in terms of the other quantities was then substituted in the other normals. In this way each group gave six sub-normals in x, y, x', y', G and ρ. The mean of all the sub-normals in x was then taken for the final equation in x, and similarly for the other quantities.

The solution of these equations gave

$$x = +''{\cdot}240 \pm ''{\cdot}023 \qquad y = +''{\cdot}080 \pm ''{\cdot}024$$
$$x' = -{\cdot}135 \pm {\cdot}025 \qquad y' = -{\cdot}227 \pm {\cdot}025$$
$$\mathrm{G} = +{\cdot}004 \pm {\cdot}017 \qquad \rho = +{\cdot}131 \pm {\cdot}020$$

The coefficient of the annual term comes out considerably larger than found by Chandler, but this series is hardly long enough to distinctly separate the 427 and 365 days periods.

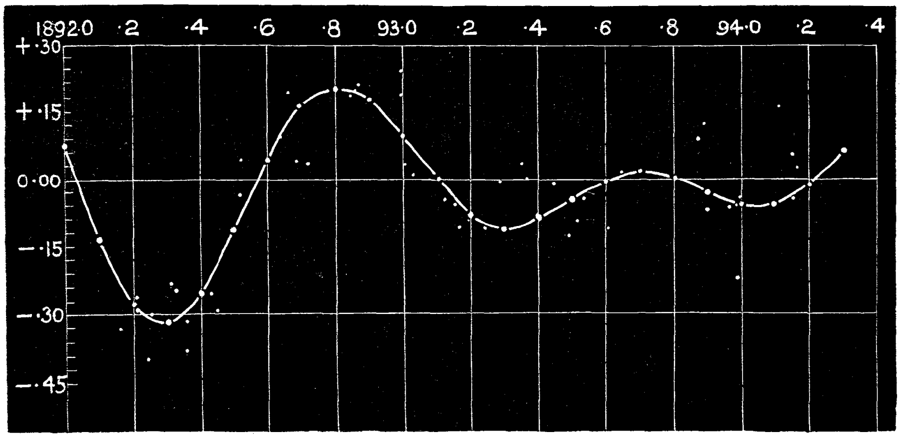
The probable error of a single equation (mean of three pairs on four nights) is $\pm''\cdot055$; so that the probable observational error of a single latitude from one pair is $\pm 0''\cdot168$.

The following table gives the variations of latitude as computed from the above solution :—

Table I. (*values of* $\phi - \phi_0$)

1892·0	$+''\cdot076$	1892·8	$+''\cdot207$	1893·6	$-''\cdot001$
·1	−·131	·9	+·184	·7	+·016
·2	−·277	1893·0	+·102	·8	+·001
·3	−·316	·1	+·004	·9	−·029
·4	−·253	·2	−·075	1894·0	−·054
·5	−·114	·3	−·098	·1	−·051
·6	+·043	·4	−·083	·2	−·010
·7	+·166	·5	−·042	·3	+·062

This curve is laid down on the accompanying diagram, and the dots show the separate results from the various groups.



The value of the aberration-constant from the above solution is larger than has been generally obtained, but the observations admit of this quantity being determined with almost entire freedom from error due to latitude-variation. There are twelve combinations of simultaneous evening and morning groups available for this purpose, but in a few cases there is a slight want of absolute coincidence in epoch. To allow for this a solution was made putting $\rho = 0$, and the quantities in the fourth column of the following table have been applied to the absolute terms of the equations. These corrections are in every case very small and have no appreciable effect on the result.

The equations are :—

TABLE II.

Group.	Date.	No. of Nights.	$\delta d\phi$	Equation of Condition.	ρ
1	1892·19	10	$-0''.28$	$C_1-C_2+\ \cdot741\rho=-''.004$	$+''.157$
2	1892·22	8			
5	1892·35	10	·000	$C_5-C_6+\ \cdot955\rho=+\cdot036$	$+\cdot188$
6	1892·35	8			
2	1892·47	10	·000	$C_2-C_3+\ \cdot985\rho=+\cdot348$	$+\cdot158$
3	1892·47	8			
4	1892·68	9	$-\cdot010$	$C_4-C_6-\ \cdot875\rho=-\cdot276$	$+\cdot131$
6	1892·67	9			
1	1892·86	6	·000	$C_1-C_3-\ \cdot849\rho=-\cdot045$	$+\cdot154$
3	1892·86	8			
4	1893·00	9	$-\cdot005$	$C_4-C_5+\ \cdot767\rho=+\cdot078$	$+\cdot110$
5	1893·01	8			
1	1893·14	9	$-\cdot021$	$C_1-C_2+\ \cdot761\rho=+\cdot021$	$+\cdot185$
2	1893·17	8			
5	1893·27	8	$+\cdot001$	$C_5-C_6+\ \cdot930\rho=-\cdot077$	$+\cdot071$
6	1893·36	8			
2	1893·47	8	$+\cdot013$	$C_2-C_3+1\cdot035\rho=+\cdot301$	$+\cdot106$
3	1893·52	9			
1	1893·90	8	$+\cdot008$	$C_1-C_3-\ \cdot793\rho=-\cdot004$	$+\cdot113$
3	1893·87	5			
4	1893·97	8	$-\cdot001$	$C_4-C_5-\ \cdot710\rho=+\cdot102$	$+\cdot152$
5	1893·98	9			
1	1894·13	8	$+\cdot014$	$C_1-C_2+\ \cdot748\rho=-\cdot083$	$+\cdot050$
2	1894·16	8			

Now the combinations of groups 1, 2 and 3 close, also those of groups 4, 5 and 6. Taking, then, these series independently, we have in the mean :—

TABLE III.

$$C_1-C_2+0\cdot750\rho=-''.022 \qquad C_4-C_5+0\cdot738\rho=+''.090$$
$$C_2-C_3+1\cdot010\rho=+\cdot324 \qquad C_5-C_6+0\cdot943\rho=-\cdot021$$
$$C_3-C_1+0\cdot821\rho=+\cdot021 \qquad C_6-C_4+0\cdot875\rho=+\cdot276$$

therefore, by addition,

$$2\cdot581\rho=+\cdot323 \qquad 2\cdot556\rho=+\cdot345$$

and

$$\rho=+\cdot125 \qquad \rho=+\cdot135$$

In the second of these series there is only one combination of groups 6 and 4, so that slightly greater weight should be given to the result of the first.

Substituting $\rho = +0''{\cdot}13$ in the equations of Table III. we find the values of $(C_1 - C_2)$ &c., and the substitution of these in Table II. leads to the separate values of ρ given in the last column of that table. The weighted mean of these is $+''{\cdot}131$, and its probable error $\pm''{\cdot}008$. These values of $(C_1 - C_2)$ &c. agree very closely with those found from the first general solution.

In the case of some of the stars the material available for the determination of proper motion is scanty, and it is quite possible that in a few cases the adopted motion may be $''{\cdot}01$ or $''{\cdot}02$ in error, but in the mean the result for ρ cannot be sensibly in error from this cause.

The constant of aberration, therefore, from this series of observations is $20''{\cdot}57 \pm 0''{\cdot}01$.

Royal Observatory, Cape of Good Hope:
1897 *October.*

Additional Note on Personal Equation. By Truman Henry Safford, Field Memorial Professor of Astronomy in Williams College.

In a former paper I have shown that the two-method personal equation is, on the average, about $0^s{\cdot}13$ to $0^s{\cdot}20$ for the ordinary time stars observed at Greenwich, and that it is persistently positive; or, in other words, that the average Greenwich observer anticipates by eye and ear the time of his own chronographic transits by an amount nearly equal to the "reaction-time" to a sense impression as determined by Wundt and other psychologists. To make rather more definite the astronomical results which I have obtained is the object of the present paper.

As the subject is one which involves two sciences, the research is one which it is difficult to put in logical order.

I will begin, then, by giving the average $e'-e$ for the years 1885 to 1894 inclusive, as derived from the Introductions to the Greenwich Observations. The averages are taken, giving each observer for the year equal weight.

Year.	Mean $e'-e$.	No. of Observers.	Year.	Mean $e'-e$.	No. of Observers.
	s			s	
1885	+0·158	5	1890	+0·180	5
1886	+0·145	6	1891	+0·122	5
1887	+0·170	5	1892	+0·165	10
1888	+0·212	5	1893	+0·123	15
1889	+0·162	5	1894	+0·162	10